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ANALYSIS

Nicotine without smoke—putting electronic cigarettes in context

John Britton and colleagues set out why a new Royal College of Physicians report supports the role of electronic cigarettes as part of a comprehensive tobacco control strategy

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Electronic cigarettes have exploded on to global markets over the past decade and in the process have generated some strongly polarised views.[1-3] Some believe that e-cigarettes are a disruptive technology that could consign tobacco smoking to history; others think that they are a distraction from core public health aims of eradicating all nicotine use and a tobacco industry ploy to perpetuate smoking and undermine international tobacco control treaties. This article summarises the findings of a new report by the Royal College of Physicians (RCP) on the role of e-cigarettes in tobacco harm reduction.[4]

Smoking: the biggest avoidable cause of harm to health

There are few practices more harmful to individuals or society than smoking. Life expectancy is reduced by around three months for every year of smoking after the age of 35.[5 6] Smoking impairs quality of life through disease and poverty,[7] causes substantial harm to others, particularly young people and unborn babies,[8] and imposes a heavy financial and opportunity cost on wider society.[7] Despite declining prevalence over recent decades there are still nearly nine million smokers in the UK, a high proportion of whom are from among the most disadvantaged in our society.[4] Smoking is still the largest avoidable cause of premature death, disability, and social inequalities in health in the UK.

Harm reduction: part of a comprehensive approach to smoking prevention

From its groundbreaking first report on smoking and health in 1962,[9] which established the pillars of global tobacco control policy,[10-12] the RCP has advocated comprehensive strategies to prevent harm caused to individuals and society by tobacco smoking. However, current policy levers have proved more effective in preventing uptake of smoking than in helping established smokers to quit. It is primarily for this reason that the RCP has advocated policies that encourage and enable smokers to switch to less harmful sources of nicotine.[13 14]

Separating toxicity from addiction

Writing in *The BMJ* in 1976, Mike Russell observed that "people smoke for nicotine but die from the tar."[15] Nicotine is most addictive when delivered to the brain quickly and in high doses. Cigarette design and the composition of tobacco have been engineered to deliver high doses of nicotine at rates that exceed even those achieved by intravenous injection. However, even at the doses absorbed from cigarettes nicotine causes little if any harm: it is the carcinogens, carbon monoxide, and thousands of other toxins in tobacco smoke that kill. This means that health harms from smoking can be avoided by replacing cigarettes with a less toxic source of nicotine.

This principle underpins evidence based guidance on tobacco harm reduction published by the National Institute for Health and Care Excellence (NICE) in 2013,[16 17] which recommends complete, or failing that partial (known as dual use), replacement of smoked tobacco with medicinally licensed nicotine replacement therapies for smokers who are otherwise unable or unwilling to quit. Those who achieve complete substitution achieve much the same in health terms as those who quit all smoking and nicotine use. People who adopt dual use gain relatively little direct health benefit but are much more likely to be able to quit smoking in the future.[16 17] However, for various reasons, including the relatively low doses or rates of nicotine delivery that nicotine replacement therapies provide and their failure to reproduce many of the behavioural and sensory components of tobacco smoking, many smokers who try nicotine replacement therapy revert to smoking.

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The emergence of e-cigarettes has revolutionised the choice of nicotine products available to smokers. Early devices were designed to resemble cigarettes, were of variable quality, and delivered relatively low doses of nicotine, but some newer designs, which are generally larger and look less like cigarettes, are able to deliver sufficient nicotine to replicate at least the venous (if not arterial) nicotine levels achieved by smoking. E-cigarettes also reproduce many of the behavioural and sensory characteristics of smoking and benefit from perception as a consumer rather than medicinal product. E-cigarettes have already overtaken nicotine replacement therapies as the primary aid used in attempts to quit smoking in the UK: an estimated 2.6 million people currently use e-cigarettes in the UK, almost all of whom are or have been smokers, and one third of whom no longer smoke.[1] As e-cigarette technology advances, nicotine delivery kinetics are likely to grow closer to those of cigarettes, making them increasingly satisfying to smokers but also probably increasing their addictiveness.

E-cigarettes: harm reduction or exacerbation?

E-cigarettes have encountered significant scepticism as well as support from the UK and international health community. Some of the many arguments advanced against their use to prevent harm from smoking have been that their long term health effects are not clearly understood; that the products may, through dual use, sustain smoking among smokers who would otherwise have quit; that they may attract young people who would not otherwise have used nicotine to become regular users, and in due course to become smokers (gateway effect); that they re-establish the act of inhaling nicotine as something that is acceptable in public and hence promote smoking (renormalisation); that they divert smokers who are motivated to quit away from evidence based smoking cessation treatment services; that they will undermine the benefits of smoke-free legislation; and that they will be used by the tobacco industry to present itself as a part of the solution to, rather than the cause of, the smoking epidemic.

The RCP report[4] explores evidence relating to all of the above concerns, and provides reassurance on almost all of them. The report argues that e-cigarettes are unlikely to be harmless, and that long term use is likely to be associated with long term sequelae, including an increased risk of chronic obstructive pulmonary disease, lung cancer, possibly cardiovascular disease, and some other long term conditions associated with smoking. However, the magnitude of this risk is likely to be very small in relation to that from tobacco smoke, and the hazard to health arising from long term vapour inhalation from the e-cigarettes available today is unlikely to exceed 5% of the harm from smoking tobacco.[4]

Among adults in the UK, e-cigarette use is almost entirely limited to those who are or have been smokers, in most cases as a means to cut down or quit smoking. Dual use of electronic and tobacco cigarettes is common, but there is no evidence that this has reduced the number of smokers who quit; nor are there grounds to suspect that the effect of dual use of tobacco and e-cigarettes will differ from dual use of nicotine replacement therapy,[16 17] which increases the likelihood of quitting. Surveys of teenagers in the UK indicate that while many try e-cigarettes once or twice, repeated use is almost entirely limited to those who are already experimenting with tobacco, with no evidence of substantial progression to smoking.[4]

The report also finds no grounds to suspect that use of e-cigarettes renormalises smoking, or that use where smoking is prohibited represents a significant hazard to health. It concludes that the availability of e-cigarettes is unlikely to be a major factor in the recent decline in number of smokers accessing stop smoking services,[18] which is more likely to have arisen from reductions in funding for antismoking media campaigns and smoking cessation services. Observational data indicate that of smokers who try to quit without accessing stop smoking services, those who use e-cigarettes are around 50% more likely to succeed than those who do not (or those who use nicoting replacement therapies bought over the counter). However, smokers who access stop smoking services are two to three times more likely to succeed,[4] indicating that encouraging e-cigarette users to access the additional support provided by stop smoking services remains important.

Tobacco industry

The tobacco industry's acquisition of many formerly independent e-cigarette producers and importers is a cause for concern. The continued aggressive marketing of cigarettes, including to children, as well as lobbying and legal challenges to tobacco control measures, make it clear that the global tobacco industry has no serious interest in reducing the harm it causes. The industry is therefore likely to try to exploit e-cigarettes to enhance its core business of selling tobacco. Restrictions on e-cigarette advertising required by the European Union Tobacco Products Directive, to be implemented in May 2016, go some way towards alleviating these concerns. In addition article 5.3 of the WHO Framework Convention on Tobacco Control provides a clear framework for governments to protect tobacco control policy development from industry interference.[19]

Regulating to promote health

To date, e-cigarettes have been regulated in the UK as general consumer products, with additional restrictions on advertising and minimum age of sale, but from May 2016 the EU directive will impose new restrictions. The requirement that the content of e-cigarette solutions and vapour emissions are reported to a designated competent authority (the Medicines and Healthcare Products Regulatory Agency in the UK), should help to raise standards in delivery and purity profiles. However, the directive will also impose limits on total nicotine content, which may diminish the effectiveness of e-cigarettes as smoking substitutes, and require health warnings on e-cigarette packs highlighting the risks of nicotine, which may discourage use. These requirements will not apply to products licensed as medicines, but manufacturers are likely to continue to be discouraged from pursuing medicines licensing by the high costs and delays that the process involves. Achieving the right balance of regulation for e-cigarettes is not easy: too much regulation can stifle innovation and reduce choice for smokers, while too little leaves smokers exposed to products that are ineffective, unduly hazardous, or both. It remains to be seen whether the directive inhibits or promotes the use of e-cigarettes for harm reduction.

Conclusions

The evidence summarised in the RCP report[4] shows that e-cigarettes have so far been beneficial to UK public health, both at individual and population level, by providing smokers with a viable alternative to tobacco smoking. While it is important to recognise that e-cigarettes are not hazard free, the primary comparator for these hazards is the substantially greater risk presented by obtaining nicotine from tobacco smoke.

Patterns of use and health impacts of electronic and tobacco cigarettes must continue to be monitored closely, and remedial measures applied promptly to deal with any changes or trends that seem counterproductive to health. It is also important that health professionals communicate the risks and benefits of electronic and tobacco cigarettes to smokers, both in practice and through the academic and popular media, objectively and dispassionately, to redress the growing misconception among smokers that these products are similarly harmful.[20] E-cigarettes and other non-tobacco nicotine products offer the potential radically to reduce harm from smoking in our society. This is an opportunity that should be managed and taken.

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Key messages

- Smoking is the biggest avoidable cause of death, disability, and health inequalities in the UK
- The hazard to health arising from long term use of e-cigarettes is unlikely to exceed 5% of the harm from smoking tobacco
- Experience in the UK suggests that e-cigarettes are more popular with smokers than other non-tobacco nicotine products and are being used almost entirely by smokers who want to cut down or quit smoking
- E-cigarettes represent an important means to reduce the harm to individuals and society from tobacco use
- E-cigarettes should continue to be supported by government and promoted as a tobacco harm reduction strategy